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Lynch et al. Respond

Doug Carroll and George Davey Smith have raised several concerns, and we thank them for their interest in our study. We agree that our measure of systolic blood pressure reactivity is unconventional, but that does not necessarily disqualify it as a valid way to assess the underlying phenomenon of cardiovascular response to stress. We have already shown that this measure predicts incident hypertension in middle-aged men.[1] The period preceding exercise is characterized by emotional, behavioral, and physiological arousal similar to that evoked by challenging mental tasks and the cold pressor test. The bike test portends a serious and potentially stressful physical challenge for the participant, and reactivity scores derived by this method may not be as sensitive to the problems of "task engagement" that can arise with computer-based mental challenges. In addition to the measure of reactivity derived from the bicycle test, the Kuopio Ischemic Heart Disease Risk Factor Study also collected, as part of the 4-year examination, a set of reactivity measures derived from a battery of computer-based mental challenges. The reactivity measures based on mental challenges also show cross-sectional relationships with carotid atherosclerosis.[2] We were aware of the potential for the bicycle-based reactivity measure to be affected by prior exercise and/or fitness levels, but preliminary analyses revealed the same results stratified by fitness level or excluding those who reported bicycling as their main form of conditioning physical exercise. Reactivity was only modestly correlated with maximal oxygen uptake ($r = -0.14$) and not related to exercise considered to be aerobically conditioning ($r = 0.02$).

Analyses conducted with continuous versions of the variables produced essentially the same conclusions. The variables were dichotomized for consistency with previous publications that have used these measures of cardiovascular reactivity and socioeconomic position.[3–5] The overall F statistic test investigates any differences among the categories, but because we had hypothesized a priori that the particular combination of low socioeconomic status and high reactivity would be related to the greatest progression of carotid atherosclerosis, we felt that this pairwise comparison was appropriate. We are sympathetic to the general point raised by Carroll and Davey Smith in regard to the inconsistent significance of F statistics under the conventional criteria. However, we are also aware of the power problems related to assessing interactions. Greenland has suggested that the precision of the interaction estimate may be only one quarter that of the main effect estimate.[6] Levels of statistical significance reflect both magnitude of effects and sample size and thus represent inherently confounded information.[7] There is nothing magical about the 5% confidence level. Its overly rigid application for delineating the importance of findings, particularly for interactions, should be approached with caution.

Finally, Carroll and Davey Smith remind us that claims of interaction should be given credence only when there is evidence of main effects. In analyses yet to be published, we have shown that, in models adjusted for age and the technical factors described in the article, the measure of systolic blood pressure reactivity based on anticipation of the bicycle test is a statistically significant and important predictor of carotid atherosclerosis. □

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On Contraception and Abortion in Armenia

I am disturbed by the research study on abortion in Armenia recently published in the Journal.[1] The authors of the study make a case for improved preventive contraceptive services, which I applaud. Having worked in the field of family planning since 1981, I appreciate the importance of preventive family planning services for women. However, to argue their case, the authors make some false statements about abortion that I feel need clarification.

The impetus for this study seems to be the decline in fertility, the increase in maternal mortality, and the increase in infertility rates between 1980 and 1995 in Armenia. It appears that the covert, if not overt, research question being addressed is the following: Is abortion the cause of these public health changes in Armenia? As the article continues, though, it becomes clear that the researchers are unable to answer this question and, instead, confuse correlation with causation. Yes, fertility has declined, maternal mortality has increased, and infertility has increased. However, the researchers fail to prove that these public health changes can be attributed to the high rates of abortion in Armenia.

Lacking modern or effective birth control methods, women in the USSR and Eastern Europe have historically used abortion as their method of birth control.[2] Given the lack of alternatives and the typical rate of fertility, it makes perfect sense that a 40-year-old woman would have had an average of 8 abortions.

It is not abortion, or what the authors call "induced abortion," that leads to high rates of maternal morbidity; rather, it is illegal and/or poorly performed abortions that can result in infection, infertility, or even death. However, continuing a pregnancy and giving birth is also very dangerous to women's health in the developing world;

rates of maternal morbidity and mortality worldwide from complications associated with pregnancy and childbirth are much higher than the rates associated with legal, safe abortion.

The study described in the article was conducted at a medical clinic where women sought abortions, which leads me to believe that abortion is legal in Armenia. Indeed, the interviewers for this study were physicians! Yet, the authors seem to imply that the choice to have an abortion is dangerous or somehow ill advised for these women. Do the doctors at this medical facility provide unsafe abortion procedures? The authors do not tell us. Do many women undergo unsafe abortion procedures in Armenia? Again, the authors do not tell us.

The authors found that the women interviewed in their study were interested in contraception (90% indicated interest in more information about contraception), yet they also had chosen to have their abortions for a variety of economic and psychosocial reasons. I feel that these women—rather ironically, most of whom are Christian—were showing a strong interest in planning their families and limiting their children to numbers that they could afford to raise, in the best way that they knew how. While this might not be our choice (in the public health community or in the Western world), I feel it is patronizing of us to say, "Well, we'd rather you didn't have so many abortions, and we'd rather you used contraception, and while you are at it, we'd rather you had more children."

Perhaps these women, given the economic and political difficulties in their country, choose to have fewer children, and that is why the fertility rate is lower than 10 years ago. However, high rates of legal, medically performed abortions have nothing to do with an increase in maternal mortality. Let's get our facts—and research questions—straight. □

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Dolyan Responds

I appreciate Cohen-Bearak's letter concerning her opinions about our article. I decided to address the comments paragraph by paragraph.

First of all, according to our article, "The purpose of this study was to determine the number of induced abortions per woman and the reasons for selecting induced abortion among parous Armenian women" and not to identify the cause of the recorded decline in fertility and the increases in maternal mortality and infertility, as Cohen-Bearak suggested. According to our article,

> Armenia, previously one of the most stable regions of the former USSR, has suffered several recent socioeconomic setbacks and natural disasters, including a breakdown of its economic system, an earthquake in 1988, and a conflict in Nagorno-Karabach. These events have undermined the public's health, as evidenced by a decline in total fertility rates . . . and an increase in the maternal mortality rate. . . . In addition, infertility rates increased.[1]

We never said that we attributed these changes to the high rates of abortion in Armenia, although high rates of abortion could have influenced these changes (addressed later). We simply tried to show that Armenian women are using abortion as a family planning method, which it is not. At the same time, we wanted to highlight the great need for family planning services and educational campaigns on modern contraception and prevention of unwanted pregnancies, which could reduce abortions.

According to the World Health Organization, "Globally, around 15% of maternal mortality results from abortion."[2] Official statistics from the Armenian Ministry of Health show that 7% of maternal mortality is due to abortions.[3] It is well known that abortions can be legal or illegal, well or poorly performed. But our article is not about that. Our article is about prevention of unwanted pregnancies and prevention of abortions. According to our article, "The historic decline of induced abortions—both legal and illegal—in Western countries has been an important component of the observed improvement in women's health."[1] We believe very much that "the substitution of effective preventive contraceptives for abortion in Eastern European countries is a realistic goal"[1] and that it is necessary. According to official statistics from the Armenian Ministry of Health, the contraceptive prevalence rate is 10%.[3]

Cohen-Bearak wanted to know about unsafe abortions in Armenia and the legality of abortions. There are no official statistics on illegal or unsafe abortions in Eastern European countries. In Armenia, abortion laws and policies are not restrictive; abortion is legally permitted and widely available to women through 12 weeks of gestation. There are thousands of maternity and abortion clinics in Eastern European countries working without essential equipment and essential medicine, without electricity and water supply, without heating, without essential training, and so forth. Thus, abortions can sometimes be unsafe, even in medical institutions. It is well known that prevention of unwanted pregnancies is more cost-effective than strengthening of abortion services in addressing unwanted pregnancies. This is why we are recommending the strengthening of family planning services and educational campaigns.

According to Cohen-Bearak's letter, "women had chosen to have their abortions for a variety of economic and psychosocial reasons." We totally agree that every woman has the right to choose how she wants to terminate an unwanted pregnancy. For many medical and social reasons, unwanted pregnancies should be prevented. Women are choosing abortion because they lack sexual education, because they were not informed about safe sex and modern contraception, and because, for many years, they did not have access to sexual education and family planning services. Public health policymakers in all Eastern European countries should think about their policies on reproductive health, family planning, sexual education, and adolescent health. □

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Morabia Responds

Ms Cohen-Bearak is concerned that our study on abortion in Armenia is a criti-